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Datasheet

MOC108/MOC108A

IoT WiFi SOC

Version : 1.8 Date : 2018-07-27 Serial number:DS0099CN

ABSTRACT

MOC108 /MOC108A is a highly integrated IoT WiFi SoC chip that contains MCU, RAM, Flash, WiFi, and a variety of IO interfaces.

MCU

- kernel：ARM 9
- Frequency：120MHz

Storage Device

- 256KB SRAM
- 2MB Flash

Interface

- 2x UART
- 1x SPI
- 1x SDIO
- 2x I2C
- 5x PWM (仅 MOC108A)
- 2x ADC
- 1x USB
- 15x GPIO (MOC108) / 23x GPIO (MOC108A)
- 1x JTAG

WiFi

- 2.4GHz single frequency section, IEEE 802.11 b/g/n
- Built-in power amplifier (PA), transceiver switch, and low noise amplifier

Security

- WEP——Using WEP64 bit or 128 bit data encryption
- WPA-PSK — — Use WPA-PSK standard encryption, encrypt type TKIP.
- WPA2-PSK[AES] — — UseWPA2-PSK standard encryption, encrypt type AES.

Chip packaging

- MOC108：32-pin QFN, 5 mm x 5mm
- MOC108A: 40-pin QFN, 5 mm x 5mm

Temperature

- Working temperature: -20 to 85 degrees centigrade
- Storage temperature: -40 to 150 degrees centigrade

Application

- Smart home / home appliances - refrigerators, air conditioners, washing machines, microwave ovens, oven, dryer, water heater, intelligent sockets, etc.
- Commercial / industrial automation - lighting, smart meter, POS
- Personal health equipment - weight scale, sphygmomanometer, blood glucose meter
- Intelligent security - security door lock
- Personal wear - a smart Watch

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Version update description

DATE	Version	Update content
2017-08-29	1.0	Initial document
2017-10-12	1.1	Update Flash size, hardware block diagram, etc.
2017-11-16	1.2	Update the hardware block diagram
2017-12-08	1.3	Update test data
2018-1-13	1.4	Adding QFN40 encapsulation MOC108A, mainly increasing the PWM interface
2018-03-02	1.5	Update test data
2018-04-25	1.6	Update PWM1, PWM2 description
2018-5-18	1.7	Update PWM1, PWM2 description Add MOC108A reference circuit
2018-7-27	1.8	Correct some pin type

Contents

Picture and table

1. Overview

MOC108/MOC108A is a highly integrated, high-performance, low-power IoT WiFi SOC, which includes ARM 9 core processor and 2.4GHz single frequency WiFi subsystem, and power management unit. The processor's main frequency is as high as 120MHz. At the same time, SoC integrated 256KB SRAM, 2MB Flash. It also contains rich peripheral interfaces such as UART, I2C and SPI. It only needs DC 3.3V voltage, and a single crystal oscillator can work. The WiFi subsystem consists of 802.11b/g/n radio frequency, baseband and multimedia access control (MAC) design to meet low power and high throughput applications.

1.1 Block diagram

The physical modules contained within the MOC108/MOC108A and the various interfaces that are connected to the outside, such as diagram 1

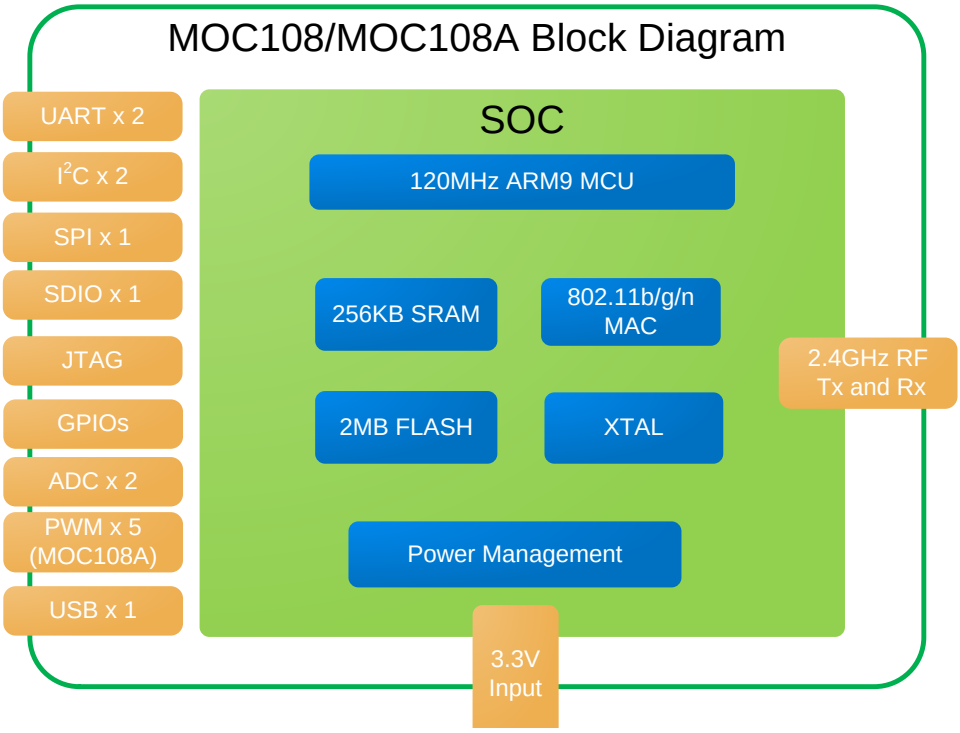


Figure 1 MOC108/MOC108A block diagram

3.3V single voltage input, MOC108/MOC108A chip internal voltage conversion circuit, the external supply of DC 3.3V conversion into 1.2V for the core processor.

1.2 WiFi standard

- 1x1 SISO IEEE 802.11b/g/n, support HT20
- Support WiFi WPS2.0
- Support WiFi Direct
- Support Easylink one key distribution network
- Support WEP/WPA-PSK (TKIP) /WPA2-PSK (AES) /WAPI security protocol

2. Pin assignment and dimension

2.1 Pin assignment

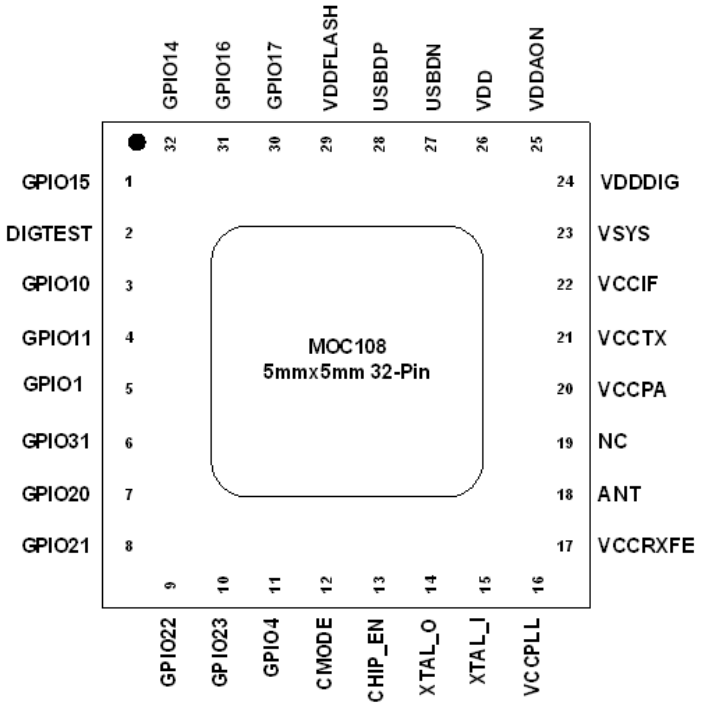


Figure 2 MOC108 pin assignment

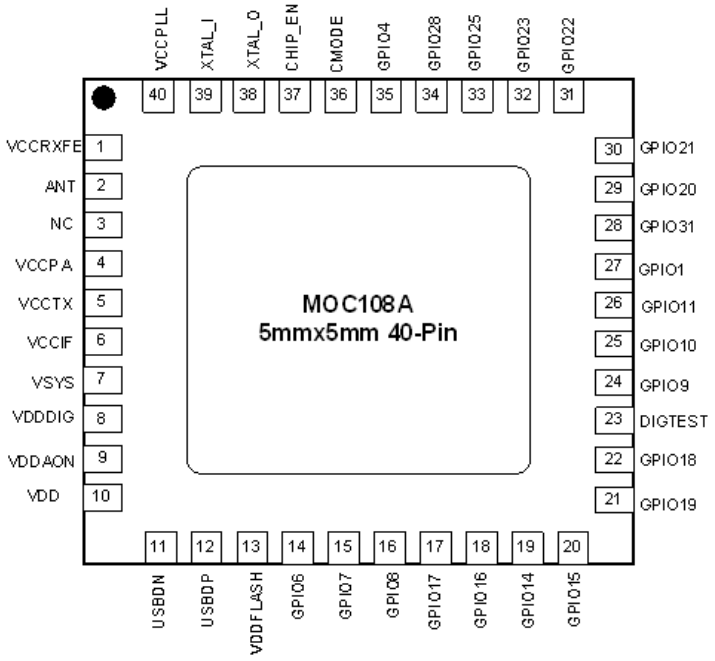


Figure 3 MOC108A pin assignment

2.2 Pin definition

Figure 4 MOC108 / MOC108A Pin definition table

32-Pin	40-Pin	Pin name	Type	Description
1	20	GPIO15	IO	GPIO15 / SD_CMD / SPI_CSN
2	23	DIGTEST	I	Used to enter FW download mode, active high
3	25	GPIO10	IO	GPIO10 / UART1_RX
4	26	GPIO11	IO	GPIO11 / UART1_TX
5	27	GPIO1	IO	GPIO1 / UART2_RXD / I2C2_SDA
6	28	GPIO31	IO	GPIO31 / UART2_TXD / I2C2_SCL
7	29	GPIO20	IO	GPIO20 / I2C1_SCL / JTAG_TCK / FLASH_SCK
8	30	GPIO21	IO	GPIO21 / I2C1_SDA / JTAG_TMS / FLASH_CSN
9	31	GPIO22	IO	GPIO22 / XHOUT(high frequency clock output) / JTAG_TDI / FLASH_SI
10	32	GPIO23	IO	GPIO23 / JTAG_TDO / FLASH_SO / ADC3
11	35	GPIO4	IO	GPIO4 / ADC1
12	36	CMODE	I	Chip operation mode 1: SDIO/USB controller mode, firmware is downloaded from Host through SDIO/USB 0: SoC mode, firmware is read from internal FLASH
13	37	CHIP_EN	I	Reset, active low
14	38	XTAL_O	O	26/40 MHz XTAL output
15	39	XTAL_I	I	26/40 MHz XTAL input
16	40	VCCPLL	I	PLL power supply
17	1	VCCRXFE	I	RX power supply
18	2	ANT	IO	2.4 GHz RF input and output
19	3	NC		Not connected
20	4	VCCPA	I	PA power supply
21	5	VCCTX	I	TX power supply
22	6	VCCIF	I	IF power supply
23	7	VSYS	O	System voltage output
24	8	VDDDIG	O	Digital Voltage LDO output,connected with decoupling capacitor

32-Pin	40-Pin	Pin name	Type	Description
25	9	VDDAON	O	Connect with de-coupling capacitor
26	10	VDD	I	Voltage input
27	11	USBDN	IO	USB data N / GPIO30
28	12	USBDP	IO	USB data P / GPIO29
29	13	VDDFLASH	I	External 3.3V for Programming Flash.
30	17	GPIO17	IO	GPIO17 / SD_DATA1 / SPI_MISO
31	18	GPIO16	IO	GPIO16 / SD_DATA0 / SPI_MOSI
32	19	GPIO14	IO	GPIO14 / SD_CLK / SPI_SCK
-	14	GPIO6	IO	GPIO6 / XHDIV
-	15	GPIO7	IO	GPIO7 / WIFI_ACT (WIFI_ACTIVE for WiFi/BT coexistence) / PWM1
-	16	GPIO8	IO	GPIO8 / BT_ACT (BT_ACTIVE for WiFi/BT coexistence) / PWM2
-	21	GPIO19	IO	GPIO19 / SD_DATA3 / PWM5
-	22	GPIO18	IO	GPIO18 / SD_DATA2 / PWM4
-	24	GPIO9	IO	GPIO9 / BT_PRIO (BT_PRIORITY for WiFi/BT coexistence) / PWM3
-	33	GPIO25	IO	GPIO25 / TXEN(Set High when RF in TX mode, to control external PA/LNA)
-	34	GPIO28	IO	GPIO28 / RXEN(Set High when RF in RX mode, to control external PA/LNA)

2.3 GPIO Multiplexer

Figure 5 MOC108/ MOC108A I/O Multiplexer

32-Pin	40-Pin	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
11	35		GPIO4				ADC1
9	31	FLASH_SI	GPIO22			JTAG_TDI	XHOUT
10	32	FLASH_SO	GPIO23			JTAG_TDO	ADC3
7	29	FLASH_SCK	GPIO20		I2C1_SCL	JTAG_TCK	
8	30	FLASH_CSN	GPIO21		I2C1_SDA	JTAG_TMS	
6	28	UART2_TXD	GPIO31		I2C2_SCL		
5	27	UART2_RXD	GPIO1		I2C2_SDA		
1	20	SPI_CSN	GPIO15	SD_CMD			

32-Pin	40-Pin	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
30	17	SPI_MISO	GPIO17	SD_DATA1			
31	18	SPI_MOSI	GPIO16	SD_DATA0			
32	19	SPI_SCK	GPIO14	SD_CLK			
27	11	USBDN	GPIO30				
4	26	UART1_TX	GIOP11				
3	25	UART1_RX	GPIO10				
28	12	USBDP	GPIO29				
-	14		GPIO6				XHDIV
-	15	PWM1	GPIO7				WIFI_ACT
-	16	PWM2	GPIO8				BT_ACT
-	21	PWM5	GPIO19	SD_DATA3			
-	22	PWM4	GPIO18	SD_DATA2			
-	24	PWM3	GPIO9				BT_PRIO
-	33	TXEN	GPIO25				
-	34	RXEN	GPIO28				

2.4 Dimension and package

2.4.1 MOC108 (QFN32 5x5)

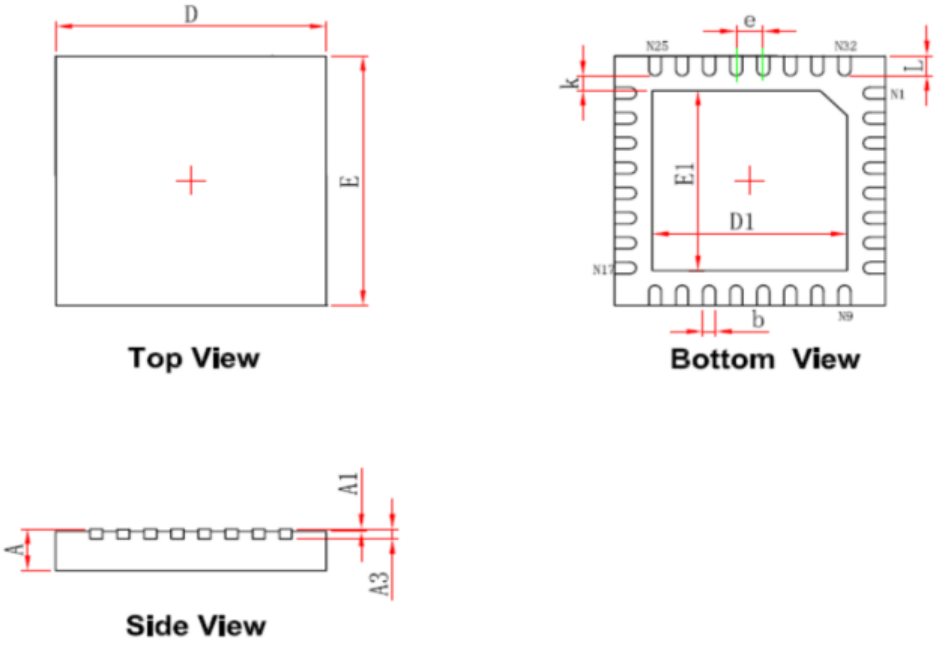


Figure 6 MOC108 size package

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	4.924	5.076	0.194	0.200
E	4.924	5.076	0.194	0.200
D1	3.300	3.500	0.130	0.138
E1	3.300	3.500	0.130	0.138
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.020TYP.	
L	0.324	0.476	0.013	0.019

Figure 7 MOC108 size table

2.4.2 MOC108A (QFN40 5x5)

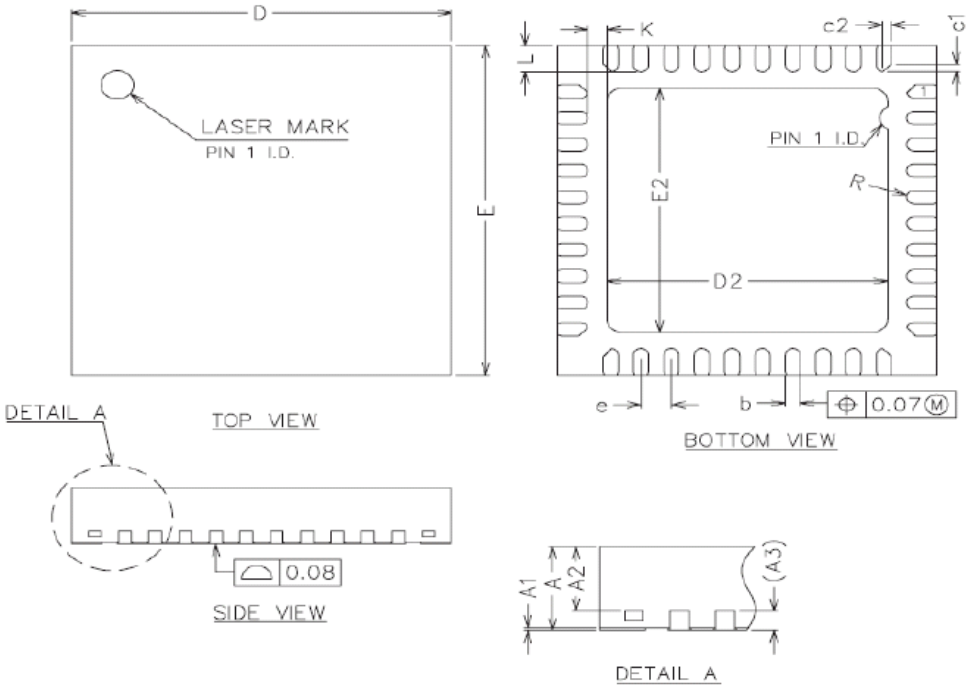


Figure 8 MOC108A size package

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0	0.02	0.05
A2	0.50	0.65	0.60
A3		0.20REF	
b	0.15	0.20	0.25
D	4.90	5.00	5.10
E	4.90	5.00	5.10
D2	3.60	3.70	3.80
E2	3.60	3.70	3.80
e	0.35	0.40	0.45
K	0.20	–	–
L	0.35	0.40	0.45
R	0.075	–	–
C1	–	0.12	–
C2	–	0.12	–

Figure 9 MOC108 size table

Note: 1. Unit: millimeter (mm). 2. Reference JEDEC document: JEDEC MO-220。

2.5 Silk screen information

Silk screen information MOC108 / MOC108A VXYWWXXX					
V	X	Y	W	W	XXX
Version	Internal code	Year	Week		Internal code

3. Wi-Fi RF specification

3.1 WiFi 2.4 GHz Tx specification

Figure 10 MOC108/MOC108A 2.4GHz Tx spec

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency	-	2400		2483.5	MHz
POWER	11b@11Mbps	-	-	20	dBm
	11g@54Mbps	-	-	12.5	dBm
	11n@HT20,MCS7	-	-	11.5	dBm
EVM	11b@11Mbps	-	-	-20	dB
	11g@54Mbps	-	-	-26	dB
	11n@HT20,MCS7	-	-	-28	dB
Frequency error	-	-10		+10	ppm
Spurious	30MHz<f<1GHz	-	-	-60	dBm/100kHz
	2.4-2.4835	-	-	-58	dBm/100kHz
	3.4-3.53GHz	-	-	-60	dBm/1MHz
	5.725-5.85GHz	-	-	-58	dBm/1MHz
	1-12.75GHz	-	-	-55	dBm/1MHz

3.2 WiFi 2.4 GHz Rx specification

Figure 11 MOC108/MOC108A 2.4GHz Rx spec

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency	-	2400	-	2483.5	MHz
Receive sensitivity	11b@11Mbps		-89		dBm
	11g@54Mbps		-74		dBm
	11n@HT20,MCS7		-71		dBm

4. Electrical parameters

4.1 Rated working condition

Figure 12 MOC108/MOC108A rated working condition

Parameter	Description	Min.	Typ.	Max.	Unit
VDD	Supply voltage	3.0	3.3	3.6	V
Operation temperature	-	-20		85	℃
Storage temperature	-	-40		150	℃

4.2 Power consumption

Figure 13 MOC108/ MOC108A power consumption

Working Mode	Current @3.3V		Note
	Average	Max	
WiFi Off	44.77 mA	45.3mA	CPU running at full speed
Keep connected with AP	100.92 mA	340.1 mA	WiFi low power mode off
Connected with AP and transmit data by UDP	92.42 mA	360.7 mA	-
EasyLink mode（Sniffer）	100.58 mA	193.2 mA	
Soft AP mode	100.65 mA	129.1 mA	

Note： The test data is for reference, and it differs by firmware and RF environment.

5. Peripherals

5.1 UART

MOC108/ MOC108A supports 2 UARTs:

baud rate up to 6Mbps

support 5/6/7/8/ bit data

support odd /even/none check

support 1 or 2 stop bit

support interruption control

Figure 14 MOC108/MOC108A supported baud rate list

Supported baud rate：	
1200	9600
14400	19200
28800	38400
57600	76800
115200	128000
153600	230400
406800	500000
921600	1000000
1382400	1444400
1500000	1843200
2000000	2100000
2764800	3000000
3250000	3692300
3750000	4000000
6000000	

5.2 SPI

MOC108/MOC108A supports a high speed SPI interface with clock frequency up to 50MHz. It supports SPI master and slave mode. There is a dedicated DMA engine for SPI, so SPI can achieve high speed data rate without an external MCU.

5.3 I2C

MOC108/MOC108A supports two I2C interfaces, with max data rate up to 400kHz.

5.4 GPIO

- MOC108 supports up to 15 GPIOs, MOC108A supports up to 23 GPIOs.
- GPIO multiplexer refer to 2.3 节
- Every GPIO can be configured as an interruption, and also can be used to wake up system from sleep mode.

5.5 SDIO

MOC108/MOC108A SDIO supports master and slave mode, with clock frequency up to 50MHz. SDIO interface can be used as master mode to read data from SD card, and also can be used as slave mode to connect with external MCU.

5.6 USB

MOC108/MOC108A USB interface supports full speed USB2.0 protocol. It can be used as Host or Device.

5.7 ADC

ADC interface parameters: original output 10bit, sampling rate up to 32kHz.

5.8 PWM

MOC108A supports 5 PWMs, MOC108 doesn’t support PWM.

6. Reference circuit

6.1 MOC108 reference circuit

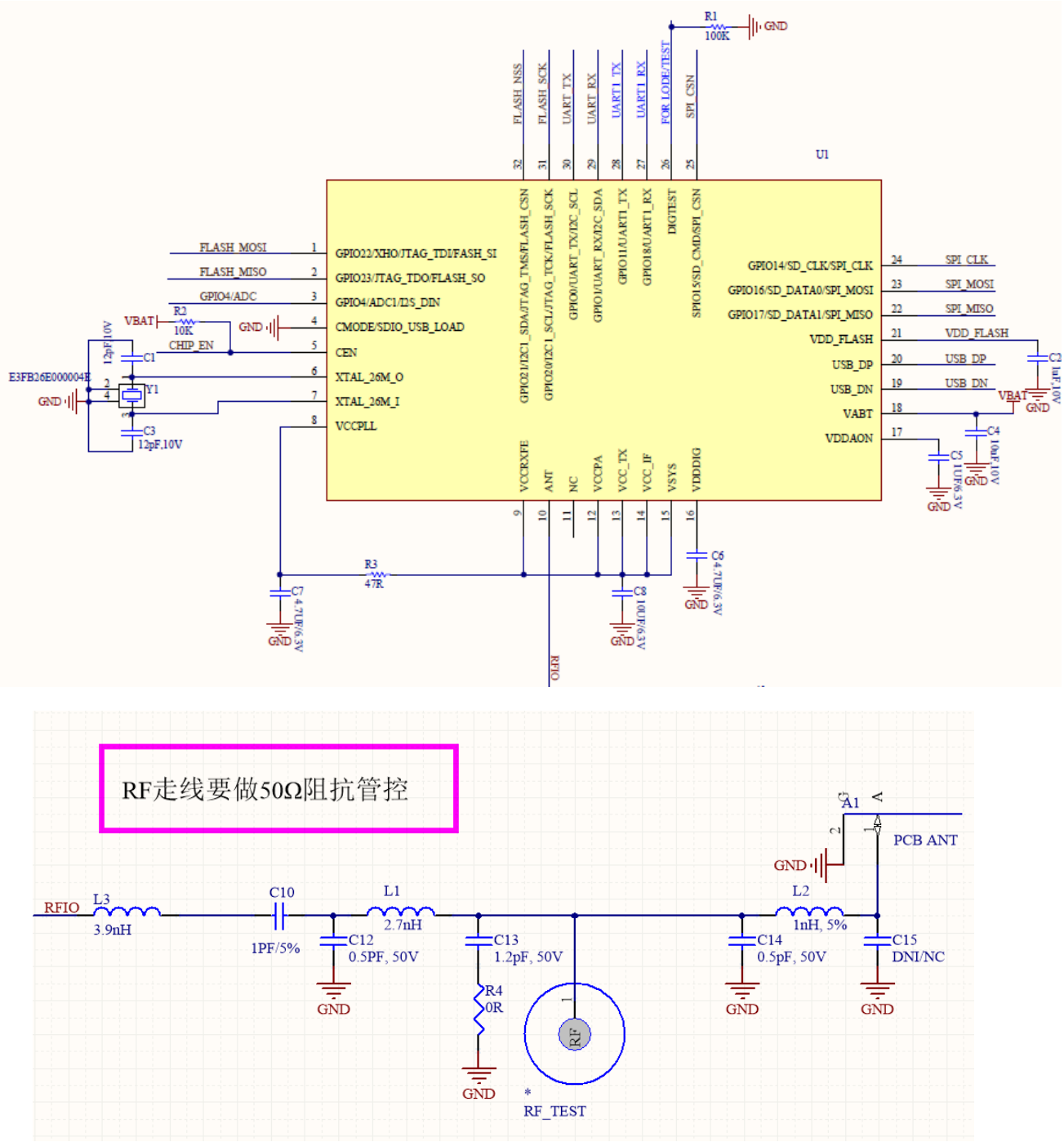
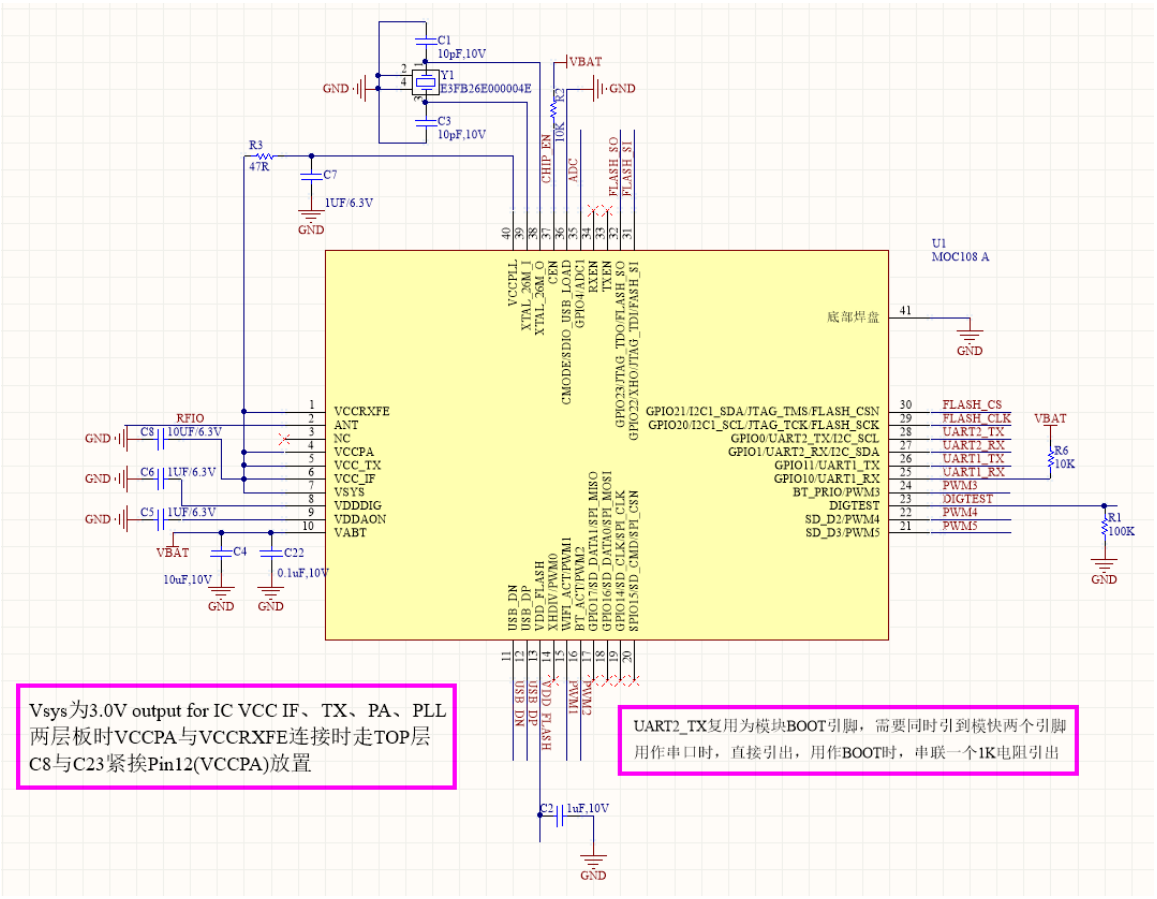
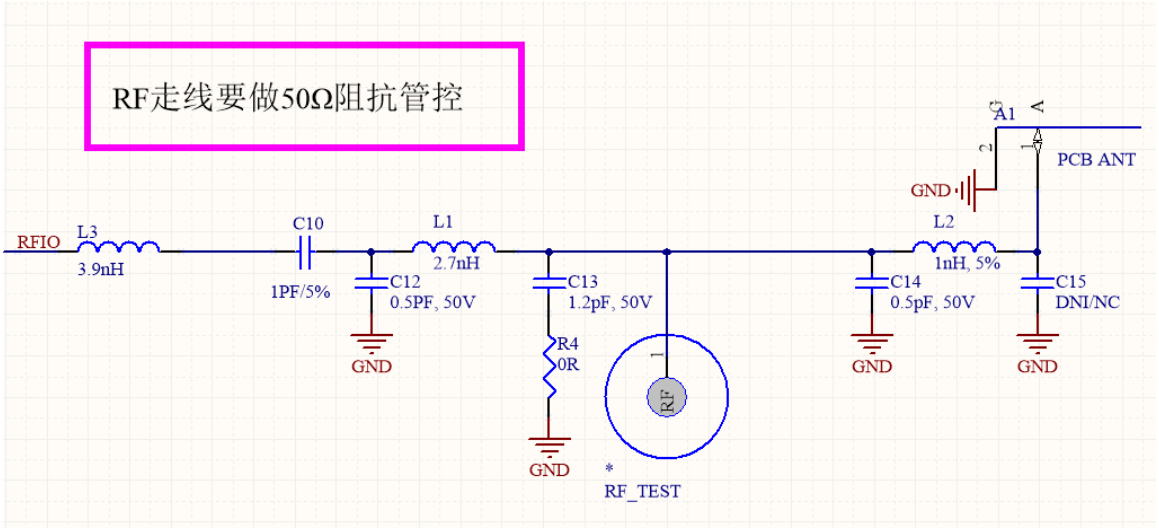


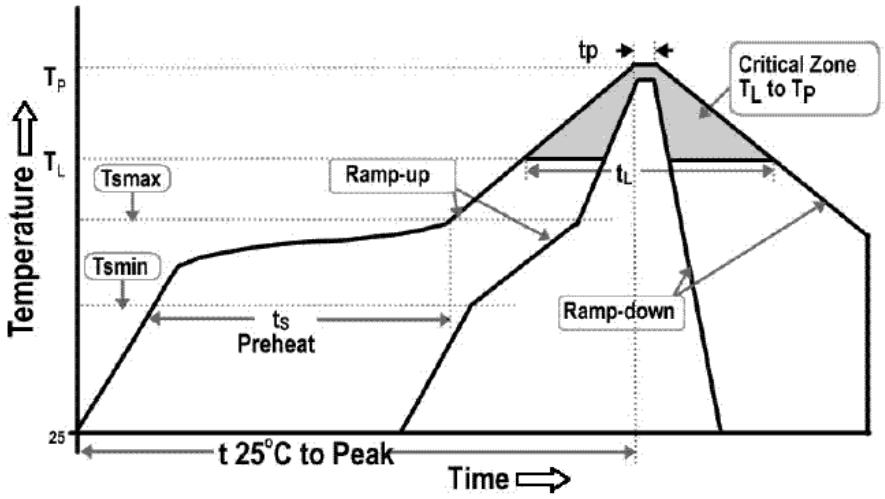
Figure 15 MOC108 reference circuit

6.2 MOC108A reference circuit





7. Reflow circuit information



Reflow circuit parameter		Specificition
Average rising speed (From Tsmax to tp)		Max 3°C/second
Preheat	Minimum temperature（T_{smin}）	150°C
	Maximum temperature（T_{smax}）	200°C
	Time（t_s）	60-180 second
Temperature keep time	Temperature（T_L）	217°C
	Time（t_L）	60-150 second
Peak temperature（T_p）		260°C
Keep time of 5°C around actual peak temperature（t_p）		20-40 second
Temperature decrease speed		Max 6°C/ second
Time from 25°C to peak temperature		Max 8 minutes

Figure 16 Reflow temperature curve

Notice about storage

1. Storage condition: storage temperature should be below 40℃, and relative humidity below 90%, and max 12 months in vacuum bag.

2. After the vacuum bag is opened, below condition should be followed when the chip is under reflow:

The factory environment: temperature below 40℃, relative humidity below 60%, reflow within 168 hours

RoHS

By 2002/95/EC(RoHS) rule, this product is free from Pb, Hg, Cd, Cr6, PBB, and PBDE.

ESD

IC are ESD sensitive, so it’s required to take right ESD protection when touch the IC.

8. MOQ and package

Part Number	Package	MOQ(pcs)	Shipping package
MOC108	QFN32_5X5	3000	Tape and reel
MOC108A	QFN40_5X5	3000	Tape and reel

9. Sales Information and Technical Support

For consultation or purchase the product, please contact Mxchip during working hours:

From Monday to Friday, morning 9:00~12:00, afternoon 13:00~18:00

Telephone: +86-21-52655026

Contact address: 9thFloor, No.5, Lane2145 JinshaJiang Road Putuo District, ShangHai.

Postcode：200333

Email: sales@mxchip.com